REV 2.1

User Guide

uTrace Evaluation Kit

This document contains instructions on how to get started with and operate the uTrace Evaluation Kit.

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Fastrax Ltd.

TRADEMARKS

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Change log

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0.2	Several additions	2006-12-28
0.3	Corrections after review	2006-12-28
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2.1	Added mandatory notices	2008-08-06

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1. COMPLEMENTARY READING

The following reference documents are complementary reading for this document:

Ref. #	Document
1	uTrace Toolkit Evaluation Reference Manual
2	Fastrax NMEA protocol manual, on-line version
3	uTrace03 Hardware Description
4	uTrace03 Electrical Connectivity Guide

2. SAFETY INSTRUCTIONS

The uTrace Evaluation Kit includes a GSM/GPRS modem, which has the same radio characteristics as ordinary GSM mobile phones. Therefore all the same restrictions of use e.g. in hospitals and aircraft apply.

The United States Transportation Security Administration announced restrictions effective January 1, 2008 on lithium batteries in checked and carry-on luggage. The rules forbid lithium batteries not installed in a device from checked luggage and restrict them in carry-on luggage by total lithium content.

The enclosure of the uTrace Evaluation Kit is not designed for use under harsh conditions. Do not expose or use the device under extreme temperatures, excessive dust, moisture or vibration; nor in flammable gases; corrosive or explosive atmospheres.

The recommended operating temperature range is from -20ºC to 60ºC (-4ºF to 140ºF). This is mainly for longevity of the battery. You should also notice that Lithium batteries can be charged between 0ºC and 45ºC (32ºF to 113ºF) only. The GMS/GPRS modem can operate in the range -30ºC to 65ºC with emergency shutdown at 75ºC. Above 100ºC (140ºF) the enclosure plastic starts to soften and may cause permanent deformation – a special version of the enclosure is available with softening point around 150ºC.

CAUTION: risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

FCC/INDUSTRY CANADA NOTICE

The uTrace Evaluation Kit is a telematics device which may cause TV or radio interference, for example, when using the device in close proximity to such receiving equipment. The FCC or Industry Canada can require you to stop using your device if such interference cannot be eliminated.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Any changes or modifications not expressly approved by Fastrax Ltd could void the user's authority to operate this equipment.

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3. SETTING UP THE HARDWARE

3.1 About network operator, subscriber connection, and SIM

When purchasing the SIM card for your uTrace03 Evaluation Kit you should have a clear understanding of the intended use profile. There are various different kind of GSM/GPRS subscriber connection types available with different price tags.

The audio call capability you will only need if you plan to use the uTrace Evaluation Kit with a headset or loudspeaker accessory.

SMS messaging is a convenient way of communicating with the uTrace. SMS messages are also buffered (stored) by the network which protects against message loss if you want the uTrace to sleep and save power most of the time and yet be able to pick up the SMS commands as soon as possible.

GPRS is the best choice if you want to transfer large amounts of data. The operators typically offer 'pay per transferred data only' or some quota like 200MB/month at a fixed price. Choosing the best fit for your use profile will keep the cost down.

Prepaid SIM is a good choice to keep the cost predictable. However, the prepaid SIM usually does not roam and keeping track of the remaining balance may be tedious.

You should also pay attention to network coverage and roaming when choosing your operator. In North America there are certain preferred operators. Please, contact support@fastraxgps.com for information.

The seller may want to activate the SIM card with your GSM mobile phone. This is a good time to set the PIN protection of the SIM card to disabled. Disabling the PIN protection is mandatory before inserting the SIM card into uTrace Evaluation Kit. This is because uTrace has no keyboard for entering the PIN code.

For internet access over GPRS you will also need to know the operator's APN (Access Point Name), username and password. If the sales person does not know these, look them up from Internet. A good search feed is for example: <Operator's name> GPRS APN.

Adding the phone number of the uTrace SIM to your mobile phone contacts is often a good idea, especially if you plan to use SMS communication.

3.2 SIM card installation

First remove the lid by pressing the release button, sliding the lid outwards, and then lifting the lid (see picture) at the bottom end. Disconnect the battery before inserting the SIM card.

Figure 1

At the end of the device you will find the yellow SIM socket eject button (see picture). Press the button with e.g. tip of pen and the SIM socket will eject.

Figure 2

Pull out the socket completely and insert the SIM card (see Figure 3). Then gently insert the socket with the SIM card into the device. The SIM socket will lock into place.

Figure 3

3.3 Connecting the battery

Insert the battery into the housing. There are two kinds of batteries.

The wired Li-Ion battery (Varta LIP 633450 A1B or Xwoda 9058GH) is placed ‘sideways’ in the battery compartment. Be careful not to cut the wire when bending it. Also make sure you’ll attach the connector polarity right. The connector fits and locks up only in one orientation.

Figure 4

The Li-Po battery has pad connectors. Slide it ‘head on’ first under the small corner brackets and then pull gently outwards the spring bracket at the other end to allow the battery to drop into place. Ensure that the spring bracket locks the battery in place properly.

Figure 5

Close the lid of the enclosure. It is easier to close the lid if you gently press it near the release button with your index finger while pushing it in place from the end with your thumb.

When the battery (power) is connected the uTrace Evaluation Kit will start up and the LEDs will turn on.

The batteries are shipped pre-charged with roughly 50% capacity and therefore charging the battery before use is recommended. The device will charge faster if you power off the device. You can power off the device by pressing the Power on/off button continuously for 4 seconds (all LEDs will shut down).

NOTE: Lithium batteries charge between temperatures 0ºC and 45ºC (32ºF to 113ºF).

CAUTION, RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

3.4 Connecting to the USB

The USB port is used for charging the battery as well as for data transfer. For charging only you can connect the USB cable to a wall adapter or cigarette lighter adapter of a car. Connecting to a PC's USB port will also allow you to charge the device, but it is first recommended to install the USB driver as instructed in chapter 4.

3.5 Installing the uTrace

To get the best navigation performance, install the uTrace in a place where it has a good and unobstructed view to the sky (to GPS satellites). The gain pattern of the GPS antenna is such that you should place the device so that the top of the device is facing upwards.

In covert installations you may need an external GPS antenna which connects to the female MMCX connector on the side of the uTrace device. The uTrace will automatically start using the external GPS antenna when it is connected and no additional parameter changes or modifications are needed.

Figure 6

One way to establish a fixed mounting of the uTrace is to screw the lid (there are holes under each rubber pad) permanently in place and then slide the device in place. To be able to release the device you should make sure there is access to the release button.

4. USB DRIVER INSTALLATION

Install the USB driver before connecting the uTrace to your PC. The installation package is found from the site:

http://isuite.fastrax.fi/downloads.html

The document Fastrax GPS Evaluation Kit Driver Installation.pdf included in the FastraxEvUSB.zip describes the driver installation process.

You may wonder why you would need wired data communication between a PC and the uTrace as the uTrace is a wireless tracking device. In fact you don't need it. However, there are several reasons why you may want to use at least occasionally the wired serial interface:

- Fast point-to-point connection – convenient for entering commands and downloading data from the uTrace to you PC.
- Data transfer is free of charge unlike with SMS and GPRS
- Enables connecting to 'real time' data visualization applications (see chapter 5) using standard protocols such as NMEA
- Enables fast firmware updates

Once the driver setup has finished successfully, go to your device manager and check which COM port number has been assigned to the uTrace device. When connecting to the device with a terminal program use that COM port number with speed 115200 baud, 8 data bits, one stop bit, no parity and no flow control.

The default protocol in the port is NMEA – so you can directly connect with applications supporting that protocol (for example Visual GPS). See chapter 5 for more details.

5. DESCRIPTION OF THE EVALUATION KIT

5.1 General

The uTrace03 Evaluation Kit is intended for the evaluation of the uTrace asset tracking platform. It contains the uTrace circuit board in a plastic casing with either a mobile phone type battery or a wired battery, a membrane type user interface with an ON/OFF button, two programmable buttons and three LEDs.

Because the user interface (buttons and LEDs) are programmable, the particular behavior depends on the application software. For reference we will describe the default behavior of the user interface implemented in version uTrace03 firmware version 2.0.0.

The following items are included in the Evaluation Kit package

- uTrace evaluation kit in plastic casing with membrane UI
- 1000 – 1300 mAh battery
- USB type A to type mini B cable
- Car Cigarette Lighter Adapter for recharging
- GPS antenna, SM-19 with male MMCX connector from San Jose Navigation Inc. (option).

Figure 7

5.2 User Interface and Connectors

The following external interfaces are available:

- On the membrane user interface:
  - On/Off button (software controlled)
  - Button 1 and 2
  - PWR LED (green), GSM LED (red) and GPS LED (red)
- Reset button and programming mode selection button
- USB type mini B connector
- IO connector (5 pins)
- Audio headset connector
- Antenna connector for external GPS antenna (MMCX female)

The Evaluation Kit with the external interfaces are shown in the pictures below.

5.2.1 On/Off switch

Keeping the ON/OFF button pressed for four seconds switches the unit on or off. When the device is on, the green LED turns on when the ON/OFF button is pressed. When the unit actually boots up all LEDs (green and both red) are turned on.

5.2.2 Button 1

Pressing button 1 triggers the sending of the position report in SMS to the first GSM contact found in the Contacts list. If no GSM contact is found in the Contacts list then the report is output from the serial port and can be seen on the terminal window if connected.

5.2.3 Button 2

Pressing button 2 dials and opens a voice call to the first GSM number found in the Contacts list. Pressing button 2 again will end the call.

5.2.4 LEDs

The LEDs indicate the state of the device according to the following table.

LED	STATE	DEVICE STATUS
PWR	solid off	asleep / powered off
	solid on	power is connected to the unit and the battery is charging
	blinks twice	power supply is connected and the battery is fully charged
	blinks thrice	power supply is not connected and the battery is discharging.
GPS	solid on	GPS tracking subsystem software lacks sufficient satellite data to provide a navigation fix solution
	solid off	GPS tracking subsystem software has sufficient satellite data to provide a navigation fix solution (or the device is powered off)
GSM	solid on	GSM subsystem is attempting to register with the network service
	solid off	GSM subsystem has successfully registered with the network service (or the device is powered off)

Table 1

5.2.5 Reset button and boot mode selection button

There are two buttons located next to the SIM card holder at the end side of the PCB. The button closer to the corner of the PCB is the reset button and the other one is the boot mode selection button.

To reset the device press the reset button. To put the device into HW programming mode press the reset button while holding the boot mode selection button pressed.

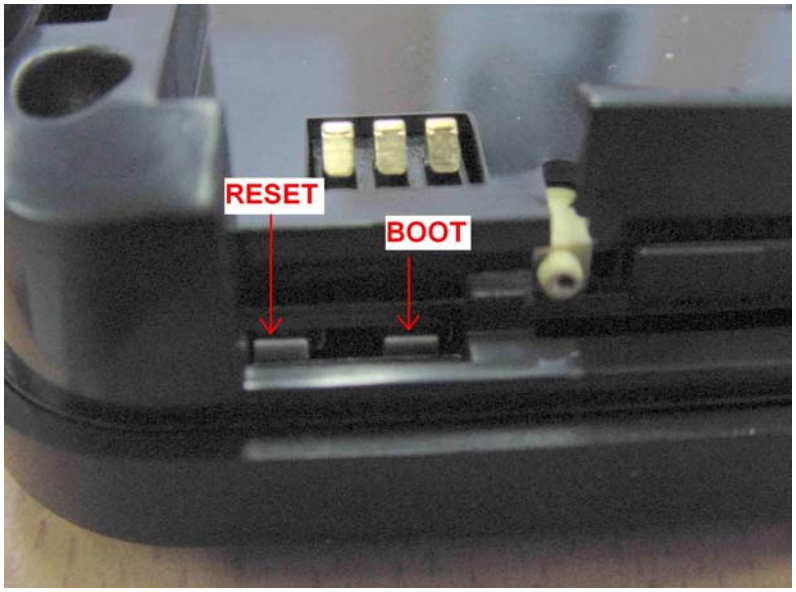

Figure 8

5.2.6 USB connector

The USB connector located on the side of the unit is off type mini-B. It is used to communicate with the device and to provide power to charge the battery.

To be able to charge the battery the voltage level on the USB connector needs to be 5±0.2 VDC. The maximum current draw when the battery is empty will be 450mA

5.2.7 IO Connector

The 5-pin I/O connector has one open-drain output and one relay input. The open drain output pin can be used to drive a relay. The relay input line can be used to connect a external push button or to detect a state of a relay. For details view the uTrace03 Interfacing Guides [ref 3 and ref 4].

5.2.8 Audio connector

The audio connector can be used to connect a standard 2.5 mm plug audio headset adapter (single ended) used with e.g. mobile phones.

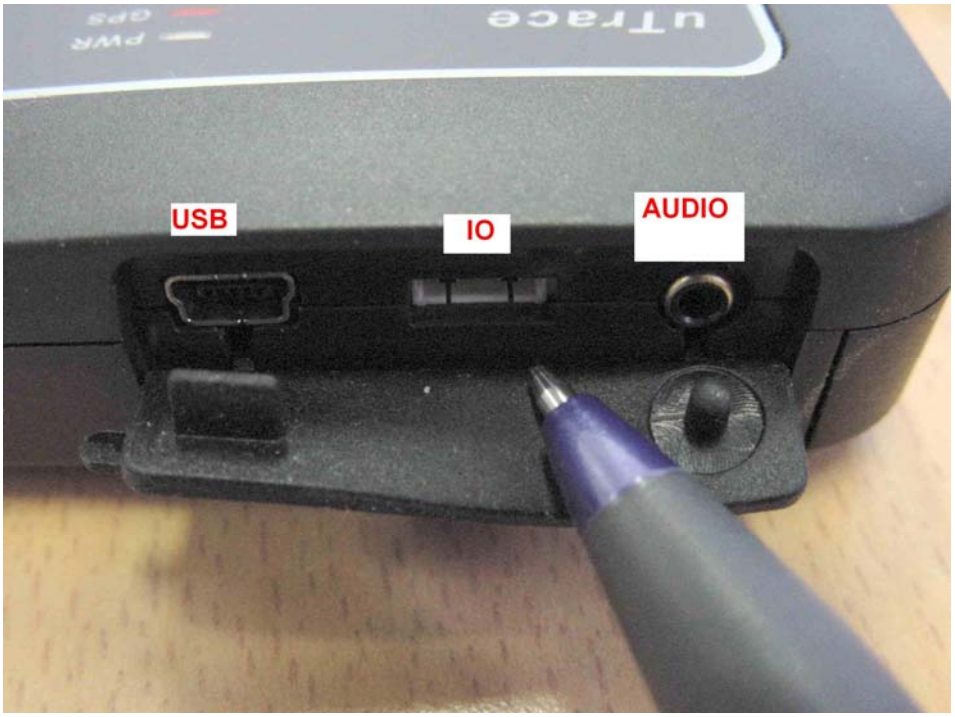

Figure 9

5.2.9 External GPS antenna connector

An MMCX female connector for connecting any 3 Volt external active GPS antenna. The device has internal switch logic to detect the external antenna state. When an external GPS antenna is connected it will be used automatically. Possible short circuit in the external GPS antenna is also detected automatically.

6. USING THE UTRACE EVALUATION KIT

6.1 Connectivity in general

The wireless connectivity of the uTrace device is illustrated in the picture below. In addition to this it is also possible to connect to the uTrace through the USB. The actual commands and data are described in detail in Ref[1].

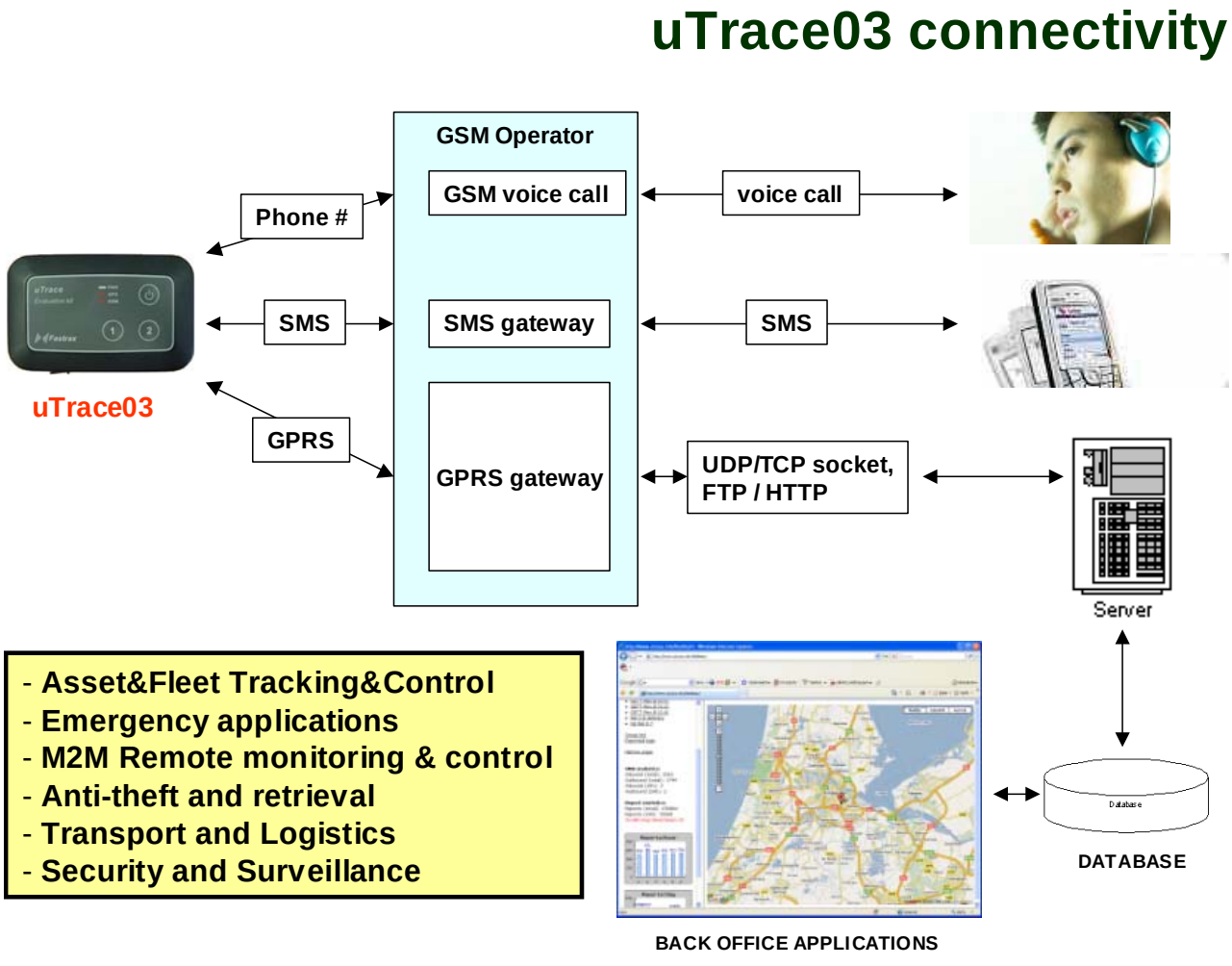

Figure 1

6.2 Connecting with a terminal program

Connect the uTrace device to the PC with the USB cable. Open a terminal application, for example Tera Term or Hyperterminal to the correct COM port, see USB driver installation.

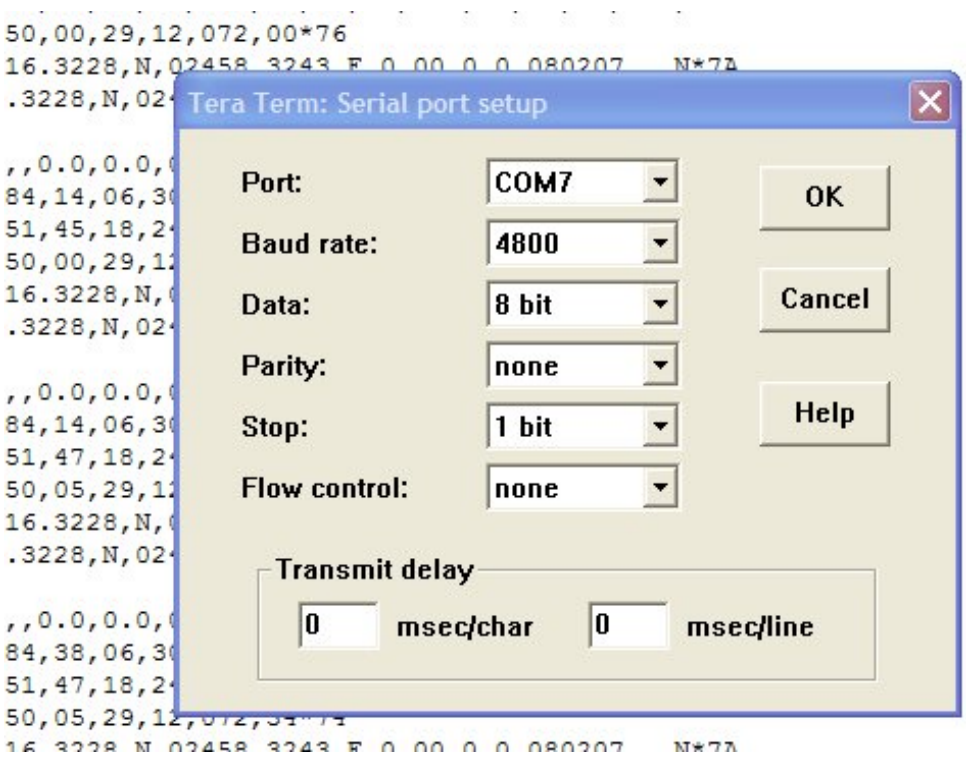

Figure 11

Set the COM port setting to 1152000 bps, 8 data bits, no parity, 1 stop bit. To enable NMEA output, give the command “$PFST,CONF,22,$A023” You should now see NMEA sentences on your terminal screen. Commands to the unit can now be given according to ref[1] and ref[2]. Note that the commands in ref[1] are given without the “$PFST,” preamble that is required for the commands in ref[2].

To easier see the responses to various commands it is recommended to mask of all NMEA sentences with the command “$PFST,NMEA,22,0”, if the NMEA output is not relevant, see ref[2].

6.3 Using SMS

If the device is in the GSM network (the GSM LED no lit) then all the commands in Ref[1] can be given as SMS also. You can send the SMS commands e.g. from your own GSM mobile phone or from the Fastrax Track&Trace server (your user account comes with a quota of 500 SMS messages).

Using SMS commands is probably the easiest way to test your setup for the first time. Simply send a SMS with your mobile phone saying “status” (without the quotation marks) to the phone number of the SIM you have installed in the uTrace Evaluation Kit. The reply will come shortly to your phone saying something like:

GPS: 10/11 int, GSM: ok, RxSig -62 dBm, Operator 244 091, Batt: 4167 mV, 06:59:32 Aug 6 2008

6.4 Connecting with Visual GPS

Visual GPS is a freeware application with graphical user interface to visualize the GPS data carried within the NMEA messages.

6.5 Connecting with GPS Workbench

Fastrax GPS Workbench is a data visualization tool using binary iTalk protocol to communicate with the uTrace over a serial connection. This tool with instructions is downloadable form Fastrax website.

GPS Workbench is able to switch the uTrace to use iTalk protocol when it is connected. Go to Tools->Options and set the correct COM port and then click the connect button.

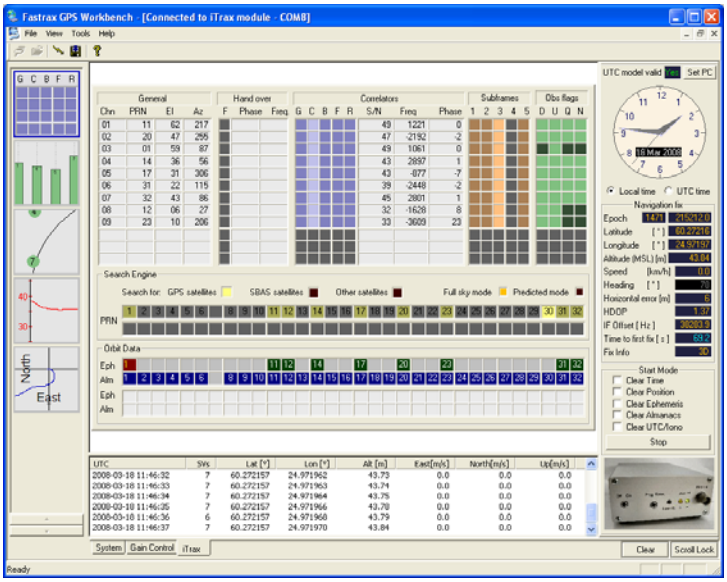

Figure 12

Note that after closing GPS workbench the uTrace device will remain switched to iTalk protocol. This will show up as garbage in the (NMEA) terminal program screen. To return to the NMEA protocol you need to reset the unit either by:

- Disconnecting and then reconnecting the battery
- Pressing the Reset button
- Sending an SMS with REBOOT command to the unit.

Remember to restore the NMEA mask if necessary, see ref[2]. All commands over SMS work normally independent of the protocol in the USB port.

6.6 Connecting to Fastrax Track&Trace Sever

When acquiring your uTrace Evaluation Kit you can apply for an User Account on the Fastrax Track&Trace Server. The server application will interface with your devices over http and/or udp, store your data into a database and visualize the data over internet. Your data is protected against other user's.

The uTrace Evaluation Kits have been preconfigured with UnitID, IP address of the Fastrax Track&Trace Server, and UDP report period of 10 minutes.

Configuration parameters which you will need set to by yourself or with the help from Fastrax Customer Support are:

- APN of your operator (SIM provider) – set into the Evaluation Kit
- Phone number of the SIM – set into the Server application

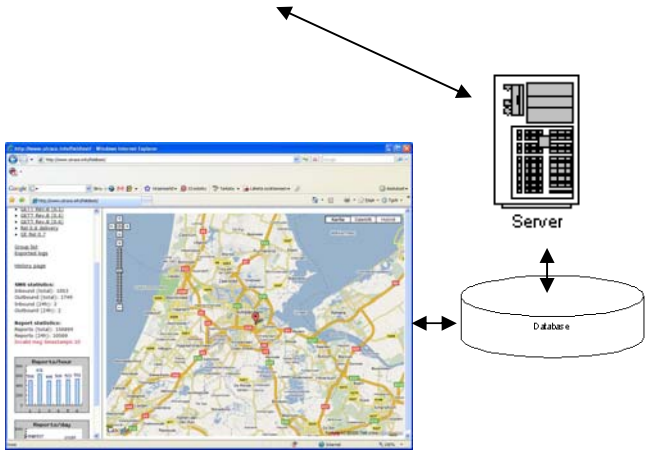

Figure 13

You will also get a quota of 500 free SMS messages to be sent through the User Interface of the Fastrax Track&Trace Server.

Detailed instructions on how to setup e.g. the UDP connection are found in ref[1].

6.7 Other useful applications

When exporting logs e.g. over to your ftp server you can use the kml (Keyhole Markup Language) format. This format is directly supported by for example Google Earth. Once your ftp export is complete you can drag and drop the kml file on top of Google Earth to view the logged data points.

Detailed instructions on how to export the logs over GPRS to e.g. a ftp server are found in ref[1].

7. UPDATING THE FIRMWARE

The uTrace firmware can be updated using the Fastrax Flash Tool. The Flash Tool can be launched from the GPS workbench or iSuite Builder by clicking the “flash arrow” icon or selecting “Program iTrax Flash” from the Tools menu.

In the Flash Tool dialog set first the target receiver type as “iTrax03 compatible receiver”. Click the “Select” button to browse to the desired firmware imange, the *.fls file. From the additional options select the correct COM port and set the speed. With a 1,5 m USB cable the maximum speed of 921600bps works fine.

If there is a firmware running on the device then software boor mode can be used. Otherwise the hardware or “already in HW” boot modes must be used. If you want to be sure to use the default parameter values then it is recommended to check the “clear FFS” check box. When all options has been set, click the “Program” button to start the programming.

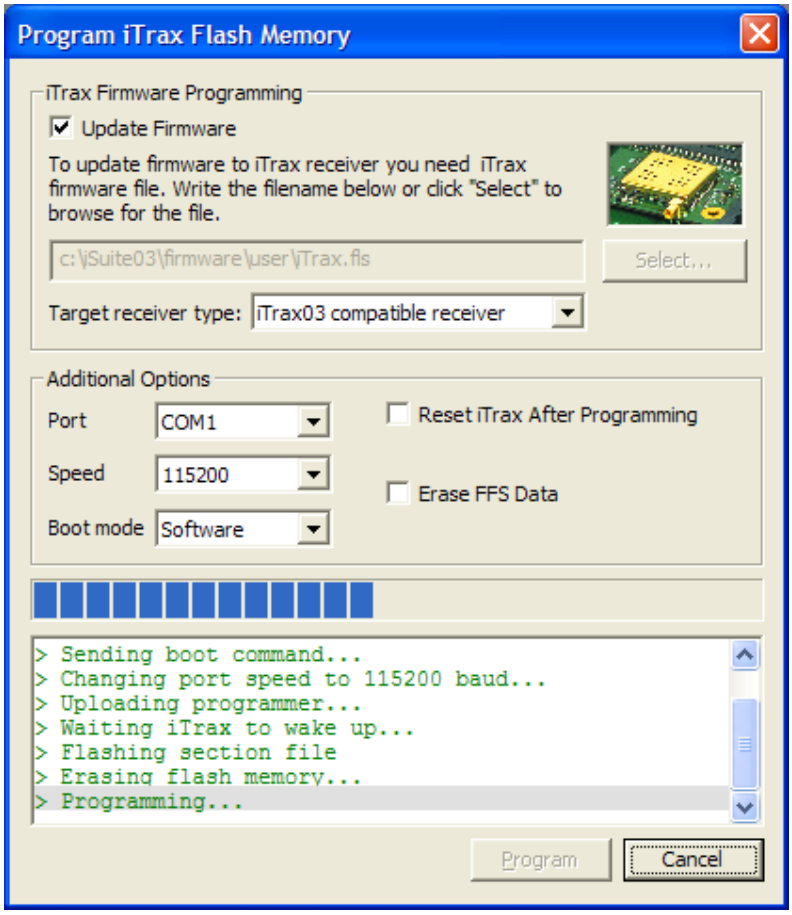
Program iTrax Flash Memory
iTrax Firmware Programming
Update Firmware
To update firmware to iTrax receiver you need iTrax firmware file. Write the filename below or click "Select" to browse for the file.
c:\iSuite03\firmware\user\iTrax.fls
Select...
Target receiver type:
iTrax03 compatible receiver
Additional Options
Port
COM1
Reset iTrax After Programming
Speed
115200
Erase FFS Data
Boot mode
Software
> Sending boot command...
> Changing port speed to 115200 baud...
> Uploading programmer...
> Waiting iTrax to wake up...
> Flashing section file
> Erasing flash memory...
> Programming...
Program
Cancel

Figure 14